

[0039] Next, referring to FIGS. 5 to 7, the description will be made about an electronic apparatus (i.e. a POS terminal) according to a second embodiment of this invention.

[0040] The electronic apparatus of FIG. 5 has a display and touch panel portion 51. The display and touch panel portion 51 includes a touch panel 52 with a vibrating function. FIG. 6 is an exploded perspective view of the display and touch panel portion 51. FIG. 7 is a partly sectional view of the display and touch panel portion 51.

[0041] The display and touch panel portion 51 serves as a display unit for displaying information and as an input unit for receiving input data. The display and touch panel portion 51 includes a front bezel 61, vibrating elements 62, fixing cushions 63, a fixing frame 64, pressing cushions 65, a liquid crystal display panel (LCD) 66, vibration absorbing members 67, and a rear cover (or a chassis) 68, in addition to the touch panel 52. A combination of the touch panel 52, the vibrating elements 62, the fixing cushions 63, the fixing frame 64, the vibration absorbing members 67, and the rear cover 68 corresponds to the panel assembly of FIG. 1. The front bezel 61 and the rear cover 68 form a housing for housing the touch panel 52, the LCD 66, and so on.

[0042] The touch panel 52 is similar to a known touch panel and configured to detect coordinates representing a pressed position on a surface thereof. Furthermore, the touch panel 52 is formed by the use of transparent substrate, transparent electrodes, transparent insulating films, and so on, so that display of the LCD 66 can be seen through the touch panel 52.

[0043] The vibrating elements 62 are unimorph type piezoelectric elements, for example. To provide a vibrating function to the touch panel 52, the vibrating elements 62 are fixed to a glass (or resinous) substrate of the touch panel 52 along upper and lower edges of the touch panel 52. The surface of the glass substrate corresponds to the rear surface of the touch panel 52. The number of the vibrating elements 62 is not limited to two and may be at least one. At any rate, one or more vibrating elements may be fixed to the touch panel 52 along the upper edge and/or the lower edge of the touch panel 52. The vibrating elements 62 are connected to a vibration control signal line 69. The vibrating elements 62 are expanded and contracted by supplying a vibration control signal (or AC voltage) through the vibration control signal line 69 and flexural vibration is caused to the touch panel 52.

[0044] The fixing cushions 63 are made of PORON HH-48 (the brand name), for example. The fixing cushions 63 are fixed to the rear surface of the touch panel 52 along edges different from those on which the vibrating elements 62 are fixed. The fixing cushions 63 are further fixed to the front surface of the fixing frame 64 and thereby the touch panel 52 is attached to the fixing frame 64. In other words, the fixing frame 64 supports the touch panel 52 through the fixing cushions 63. The fixing cushions 63 serve as fulcrums when the touch panel 52 vibrates. As mentioned regarding the first embodiment, it is desirable that the fixing cushions 63 are made of material which allows the touch panel to vibrate and which can avoid damping the vibration of the touch panel 52 as possible and which is neither too soft nor too hard. For example, the material may have about 40 degrees of hardness. When the fixing cushions 63 are too hard, it is difficult for the touch panel 52 to vibrate. To the

contrary, when the fixing cushions 63 are too soft, it absorbs the vibration of the touch panel 52 to reduce amplitude of the vibration.

[0045] As shown in FIG. 7, the pressing cushions 65 are disposed between the front bezel 61 and the touch panel 52 to make an interval 71 between them. The pressing cushions 65 are designed so as not to prevent and absorb the vibration of the touch panel 52. Furthermore, the pressing cushions 65 are designed so that the touch panel 52 does not touch (or tap) the front bezel 61 during the vibration thereof. To meet these conditions, material and size of the pressing cushions 65 are appropriately selected and decided. In this embodiment, the pressing cushions 65 made of soft urethane form, e.g. POLON L32 (the brand name), are disposed at vicinities of four corners of the touch panel 52. Because the pressing cushions 65 are disposed at the vicinities of the four corners of the touch panel 52, the touch panel 52 is further securely and stably held without preventing and absorbing the vibration thereof.

[0046] The LCD 66 has a known configuration and size for being placed at the inside of the fixing frame 64. The LCD 66 is fixed to the rear cover 68 by means of, for example, screws.

[0047] The vibration absorbing members 66 are fixed to the rear surface of the fixing frame 64 and to the rear cover 68. Consequently, the fixing frame 64 is fixed to and supported by the rear cover 68. The vibration absorbing members 66 are made of material which is very soft in comparison with that of the fixing cushions 63. The vibration absorbing members 66 absorb the vibration of the fixing frame 64 to prevent or suppress transmission of the vibration from the fixing frame 64 to the rear cover 68.

[0048] In the structure mentioned above, the touch panel 52 vibrates according to wave form of the vibration control signal by the use of the fixing cushions 63 as fulcrums, when the vibration control signal is supplied to the vibrating elements 63 through the vibration control signal line 69. Because the fixing cushions 63 hardly absorb the vibration of the touch panel 52, the vibration is transmitted to fixing frame 64 and thereby the fixing frame 64 vibrates. The vibration of the fixing frame 64 is absorbed (or damped) by the vibration absorbing members 67 and hardly transmitted to the rear cover 68. Therefore, the vibration is also hardly transmitted to the LCD 66 fixed to the rear cover 68. Thus, it is prevented or suppressed that the vibration of the touch panel 52 exercises a harmful influence on the components, which include the LCD 66, fixed on the rear cover 68. Therefore, reliability of the whole electronic apparatus is improved.

[0049] According to the embodiment, the electronic apparatus vibrates the touch panel 52 when an operator executes input operation to the touch panel 52. Consequently, operation feeling is given to the operator by the touch panel 52.

[0050] While this invention has thus far been described in conjunction with the preferred embodiments thereof, it will readily be possible for those skilled in the art to put this invention into practice in various other manners. For example, the electronic apparatus may be an automatic teller machine (ATM), a point of sale (POS) terminal, a personal computer (PC), a personal digital assistant (PDA), a mobile telephone, or the like. At any rate, this invention is appli-